



JOYSTICK CONTROLLERS

FINGER OPERATED

INNOVATION IN MOTION

The Penny+Giles range of finger operated joystick controllers have been developed for the smooth, precise control of critical functions in a variety of industrial applications where a Human-Machine Interface (HMI) is required. Available in one, two or three axis configurations, the finger operated range has a choice of six different models, with ergonomic handle styles to enable superb proportional control. Each model has a range of selectable options for the most comprehensive matching of the joystick to your application.

Features

- Potentiometric or Hall effect sensing
 - Single and multi-axis control
 - Low profile handles
- Most models protected to IP65 minimum above the panel
 - Choice of outputs and switches
- Choice of handles with additional functions
 - Standard connectors

Benefits

- Long life and maintenance-free operation
- Suited to a range of control functions
- Unintentional operation reduced
- Operation in demanding environments
- Enables user configuration for system safety
- Increased operator control
- Simple, error free installation



Ergonomic handles

This range has been developed with operator comfort in mind. By reducing the mental and physical effort required to operate your equipment, Penny+Giles joysticks can help to increase your productivity. The small single axis rockers and controllers require

minimal effort to move the handles, which are styled to fit comfortably with finger and thumb operation. The multi-axis controllers have a choice of handle styles that allow you to select additional functionality for operator controls, with push button switches for 'Person present' detection, or a third axis of proportional control. In addition, the JC400 model can be specified with a choice of three lever forces.

Selection Guide

Penny+Giles offers the widest choice of options to suit your application.



JC025 Page 6

- Single axis rocker
- Compact, low profile with a choice of rocker styles and outputs

JC030 Page 6

- Single axis rocker
- Compact, low profile with a choice of outputs



EMC Directive 89/336/EEC

The products detailed in this document are supplied as components for installation into an electrical apparatus or system. They are outside the scope of the EEC directive and will not be CE marked.



Certificate number LQR 0924881

Quality Assurance

Penny+Giles are accredited to BS EN ISO9001:2000

Quality is at the heart of all our systems ensuring the reliability of our products from initial design to final despatch.

JOYSTICK CONTROLLERS

FINGER OPERATED



Innovative design

The Penny+Giles joystick range are displacement joysticks that provide electrical signals in direct proportion to the movement of the lever. Two different types of sensing technology are utilised in the finger operated controller range.

The JC025, JC030, JC100, JC120 and JC400 models use long life potentiometer tracks with directional/center switching, and the JC2000 model uses non-contact Hall effect sensors.

Potentiometric sensing

Designed to interface with an electronic controller, the long-life potentiometer tracks generate analogue outputs with switched reference signals that are proportional to the distance and direction over which the handle (or rocker) is moved. The analogue output can be factory configured to provide signals for fault detection circuits and a center tap provides an accurate voltage reference for the center position or a zero point for a bipolar supply voltage. An electrically independent switch operates with separate contacts each side of the joystick center position, in each available axis.

The key advantages of this technology are its linear output and the versatility it derives from its simplicity; it consists of a carbon-based potentiometer track with no complex circuitry or electronics, so it is not susceptible to electromagnetic interference or magnetic fields. However, as a contacting device it does have a long, but finite, life and due consideration should be given to applications subject to high intensity use or where high dither or vibration may be encountered.

Hall effect sensing

The JC2000 model uses non-contact Hall effect sensors to provide one, two or three axes of precision fingertip control, with dual independent outputs in the single and dual axis models for built-in redundancy and increased reliability. The key advantage of using Hall effect sensors is that they offer very long life because they have no contacting parts. They allow a very compact under-panel depth - as much as half the space of comparable potentiometer designs. Hall effect joysticks are more sensitive to electromagnetic interference, but this has been minimised by using appropriate shielding and robust circuit design for all but the most demanding environments.



JC100 Page 8

- Single axis joystick
- Low profile lever with a choice of outputs



JC120 Page 10

- Single axis joystick
- Lower profile lever with a choice of heights, outputs and protective boot
- Narrow width



JC400 Analogue Page 12
JC400 Digital Page 15

- Multi axis joystick
- Compact, minimal size with a wide range of mechanical and electrical options



JC2000 Page 22

- Multi axis contactless joystick
- Compact, minimal under-panel depth with a wide range of mechanical and electrical options

JOYSTICK CONTROLLERS

FINGER OPERATED



Total reliability

By using design innovation, careful materials selection and extensive real-life applications knowledge, Penny+Giles engineers have developed a range of joystick controllers that require no maintenance throughout an expected working life of greater than five million operations (fifteen million operations for the JC2000). We also fit standard electronic connectors to the majority of our joysticks to help reduce both your installation time and the potential for wiring errors during your manufacturing process.

Safety

Joysticks fitted with the long-life potentiometer tracks can have additional resistors connected in series with the main resistive element to limit the output signals to 10-90% or 25-75%. This can be used as part of your systems comparison and error detection routine, where an out of range signal could indicate a wiring fault. Additional independent switch functions are provided for directional and center position indication - vital for system start-up safety. The JC2000 model uses Hall effect sensors and is supplied with dual independent outputs fitted as standard on the single and dual axis versions. The signals can be monitored and compared for failure detection in safety critical applications. See page 26 for application and usage notes on this model.



Custom design

Penny+Giles offer an extensive range of finger operated joysticks in standard modular configurations, designed to meet the majority of individual customer needs, but we can customise our designs for OEMs who require something more specialised to their application. Please talk to our technical sales team about your requirements.

Cell manufactured

The modular design of the finger operated joystick range is intended to provide the user with the widest possible choice of standard options, but allows efficient build and despatch by using cellular manufacturing principles. Contact your nearest sales office for the latest information on availability of these joysticks.



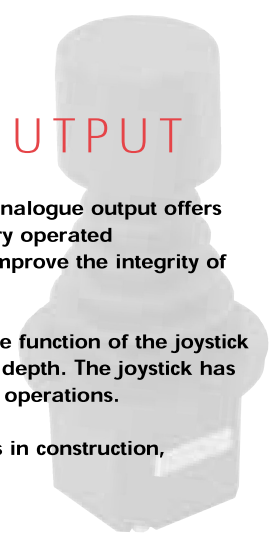
JC400

MULTI AXIS JOYSTICK ANALOGUE OUTPUT

Developed for use in applications where compact size and functionality are important, the JC400 with analogue output offers proportional fingertip control in up to three axes. The JC400's range of ergonomic handles feature rotary operated potentiometers, or switches, for a third axis of control, or 'Person Present' switches that can be used to improve the integrity of your control system.

Installation flexibility has been provided by using different forms of mounting flanges independent of the function of the joystick and the analogue track models are supplied with side exit cables to minimize the required under panel depth. The joystick has been designed for maintenance-free operation throughout an operating life of greater than five million operations.

Typical applications include remote control chest packs, CCTV camera controls and the operator controls in construction, agricultural or material handling equipment.



PERFORMANCE MECHANICAL

Lever operating force

breakout	N	2, 2.5 or 3*
operating	N	7.5, 11 or 12* (full deflection)
maximum allowable	N	250* (full deflection)
Lever mechanical angle	°	±20 in X and Y directions
Lever action (options)		Self centering, aligned X and Y or non aligned
Lever gate profiles (options)		Single axis, square, round, diamond or cross
Expected life		>5 million operations
Weight	g	150 nominal, without handle fitted *50mm above mounting flange face

ENVIRONMENTAL

Operating temperature	°C	-40 to +70
Storage temperature	°C	-50 to +85
Environmental protection above flange		IP65 IEC 60529

ELECTRICAL

Analogue Track

Resolution		Virtually infinite
Track resistance ±20%	kΩ	4, 5 or 8
Track operating angle	°	±16
Output voltage range	%	0-100, 10-90 or 25-75 of input (±2%)
Center tap voltage (no load)	%	48 - 52 of applied voltage
Center tap angle	°	±2.5
Supply voltage - maximum	Vdc	30
Wiper circuit impedance	MΩ	Greater than 0.1**
Power dissipation @ 20°C	W	0.25 (no load)

** The long life resistive elements require a high impedance load in the wiper circuit to minimise the current flowing through the wiper for optimum conditions

Switch -

Directional or Center Off/Center On†

Switch operating angle	°	5 either side of center (±1)
Supply voltage - maximum	Vdc	30
Load current - maximum	mA	5 resistive (or 200 with reduced switch life of 1 million operations)

† The JC400 has an additional center on switch in each axis

DIMENSIONS

Note: drawings not to scale

INSTALLATION

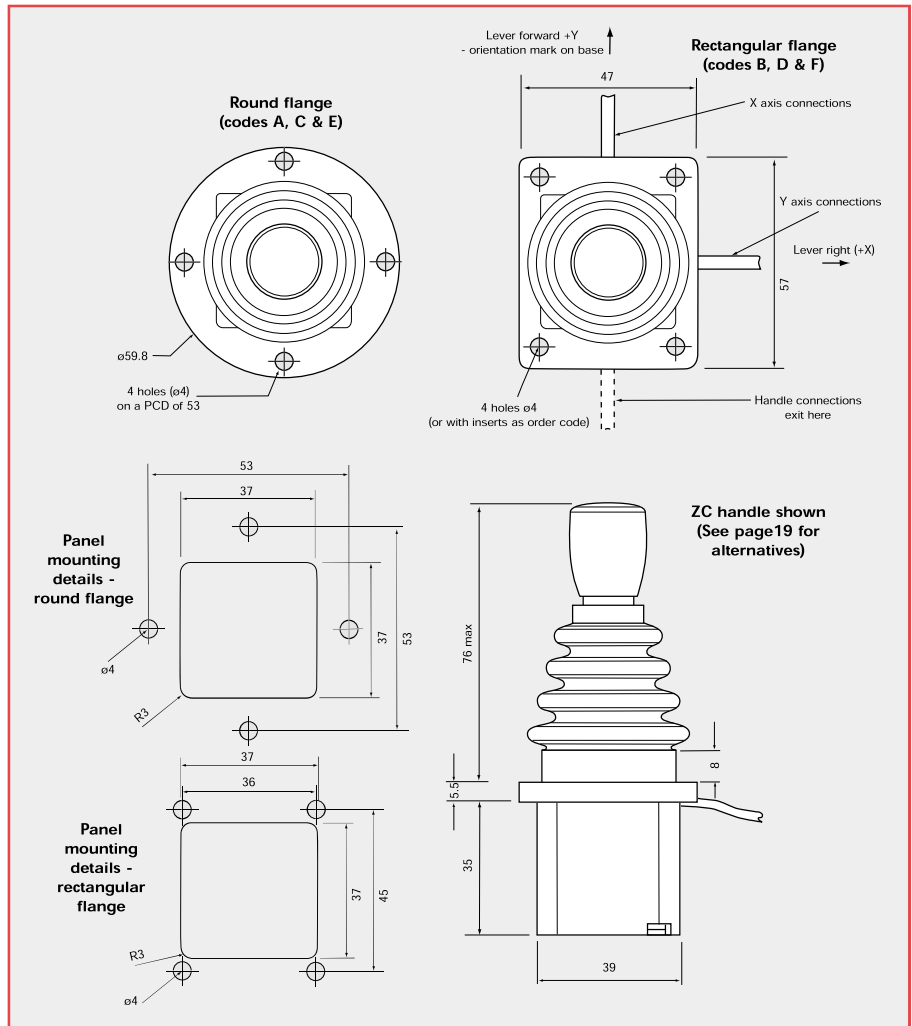
The joystick is designed to be fitted from below the mounting panel, through a 37mm x 37mm square hole. The effectiveness of the joystick flange sealing is dependent on the panel mounting surface being sufficiently rigid to compress the sealing gaiter. The surface finish of the mounting panel is also critical to achieving an adequate seal and rough surface finishes, paint chips, deep scratches, etc. should be avoided.

Recommended panel thickness

3.5 to 6mm

Recommended screw torque

The JC400 joystick has three options for each mounting flange style, which include through holes and thread inserts in the 4mm diameter holes. To maintain an effective seal between the joystick flange and the mounting panel, the mounting screws should be tightened to a suitable torque to match the selected attachment screw size.



ELECTRICAL CONNECTIONS

PVC insulated 7/0.2 (24AWG) flying leads, 240mm long

Description


Y axis forward - positive voltage supply
 Y axis center tap
 Y axis backward - negative or zero voltage supply
 Y axis output voltage signal
 Y switch track N/O (lever forward +Y)
 Y switch track N/O (lever backward -Y)
 Y switch track center on
 Y switch track common

X axis right - positive voltage supply
 X axis center tap
 X axis left - negative or zero voltage supply
 X axis output voltage signal
 X switch track N/O (lever right +X)
 X switch track N/O (lever left -X)
 X switch track center on
 X switch track common

Flylead colour

Green
 Brown
 White
 Black
 Pink/Black
 Green/Red
 Red/Brown
 Yellow/Green

Orange
 Grey
 Red
 Yellow
 Orange/Black
 Red/Black
 Orange/Red
 Purple/Red

See over  for ordering information

JC400 ANALOGUE OUTPUT HOW TO SPECIFY

PERFORMANCE OPTIONS	FEATURE	CODE
MOUNTING FLANGE	Round flange, 59.8mm diameter with 4 x 4mm through holes	A
	Rectangular flange, 47 x 57mm with 4 x 4mm through holes	B
	Round, as code A, but with Metric thread inserts (M3 x 0.5p)	C
	Rectangular, as code B, but with Metric thread inserts (M3 x 0.5p)	D
	Round, as code A, but with Unified thread inserts (4-40 UNC x 0.025)	E
	Rectangular, as code B, but with Unified thread inserts (4-40 UNC x 0.025)	F
AXES	Single axis with analogue track	Y
	Dual axis	XY
TRACKS	Analogue potentiometer, 4k, 0-100%, $\pm 5^\circ$ directional switch	NN
	Analogue potentiometer, 5k, 10-90%, $\pm 5^\circ$ directional switch	RR
	Analogue potentiometer, 8k, 25-75%, $\pm 5^\circ$ directional switch	QQ
DETENTS	Not available with analogue tracks	-/-
LEVER SPRING FORCE	Light duty, 2N breakout, 7.5N full deflection	LA
	Medium duty, 2.5N breakout, 11N full deflection	MA
	Heavy duty, 3N breakout, 12N full deflection	HA
HANDLE STYLES See page 18	Standard handle, no functions	ZC
	Standard handle with momentary push button	ZC1
	Standard handle with momentary switch action	ZCS
	Rotary Z axis handle with analogue track and directional switch	ZA or ZA2
	Rotary Z axis handle with end of travel switches only	ZAS
	Finger grip handle with momentary top button switch	SW1
	Finger grip handle with two momentary side button switches	SW2
Finger grip handle with two momentary side and top button switches	SW3	
GATE (lever movement limiter)	Square	S
	Round	R
	Diamond	D
	Cross - only suitable for use with non-switched handles (ZC)	C
SEAT	Aligned with axis	P
	Non-aligned	N

EXAMPLE ORDER CODE **JC400-A-XY-NN-/-MA-ZA-S-P**

JC400

MULTI AXIS JOYSTICK DIGITAL OUTPUT

Developed for use in applications where compact size and functionality are important, the JC400 with Digital Output option offers fingertip control in one or two axes, with a choice of handles for a third axis of control. The JC400's range of ergonomic handles feature rotary operated potentiometers, or switches, or 'Person Present' switches that can be used to improve the integrity of your control system.

The Digital track option includes a detent mechanism that provides three sequential positions either side of the center position. The detent positions align with the switch outputs in true X and Y directions only.

Installation flexibility has been provided by using different forms of mounting flanges independent of the function of the joystick, and the digital output joysticks are fitted with standard electronic connectors to minimize installation time. The joystick has been designed for maintenance-free operation throughout an operating life of greater than five million operations.

Typical applications include remote control chest packs, CCTV camera controls and the operator controls in construction, agricultural or material handling equipment.

PERFORMANCE MECHANICAL

Lever operating force		
breakout	N	3, 4 or 6*
operating	N	12, 13.5 or 18* (full deflection)
maximum allowable	N	250* (full deflection)
Lever mechanical angle	°	±20 in X and Y directions
Lever action (options)		Self centering, aligned X and Y or non aligned
Lever gate profiles (options)		Single axis, square, round, diamond or cross.
Expected life		>5 million operations
Weight	g	150 nominal, without handle fitted *50mm above mounting flange face

ENVIRONMENTAL

Operating temperature	°C	-40 to +70
Storage temperature	°C	-50 to +85
Environmental protection above flange		IP65 IEC 60529

ELECTRICAL

Number of switch positions		3 either side of center
Number of detents		3 either side of center
Switch/detent angles	°	±6.6, ±13.3, ±20
Supply voltage - maximum	Vdc	30
Load current - maximum	mA	100 resistive @25°C

TRUTH TABLE

Truth table for digital switch track output
Y and X axis signals are Normally Open (0) at lever center position. Switch sequences close (1) depending on direction of lever movement and detent position.

Detent Position	Switch Output			Right (or Forward)	Left (or Backward)
	1	2	3		
3	1	1	1	1	0
2	1	1	0	1	0
1	1	0	0	1	0
0	0	0	0	0	0
-1	1	0	0	0	1
-2	1	1	0	0	1
-3	1	1	1	0	1

JC400 DIGITAL OUTPUT HOW TO SPECIFY

PERFORMANCE OPTIONS

MOUNTING FLANGE

AXES

TRACKS

DETENTS

LEVER SPRING FORCE

HANDLE STYLES

See page 18

GATE

(lever movement limiter)

SEAT

FEATURES

Round flange, 59.8mm diameter with 4 x 4mm through holes
 Rectangular flange, 47 x 57mm with 4 x 4mm through holes
 Round, as code A, but with Metric thread inserts (M3 x 0.5p)
 Rectangular, as code B, but with Metric thread inserts (M3 x 0.5p)
 Round, as code A, but with Unified thread inserts (4-40 UNC x 0.025)
 Rectangular, as code B, but with Unified thread inserts (4-40 UNC x 0.025)

Single axis with digital track
 Dual axis

Digital - 3 switches either side of center

Only available with digital tracks

Light duty, 3N breakout, 12N full deflection
 Medium duty, 4N breakout, 13.5N full deflection
 Heavy duty, 6N breakout, 18N full deflection

Standard handle, no functions
 Standard handle with momentary switch action
 Rotary Z axis handle with analogue track and directional switch
 Rotary Z axis handle with end of travel switches only

Square
 Round
 Diamond
 Cross - only suitable for use with non-switched handles (ZC)

Aligned with axis
 Non-aligned

CODE

A
B
C
D
E
F

X
XY

DD

D

LD
MD
HD

ZC
ZCS
ZA or ZA2
ZAS

S
R
D
C

P
N

EXAMPLE ORDER CODE

JC400-B-XY-DD-D-MD-ZC-R-N

JC400 MULTI AXIS JOYSTICK HANDLE OPTIONS



ZA

The ZA and ZAS handles are designed to give an additional axis of proportional or switched control, using fingertip action to rotate the handle. The handles have a self-centering action when released, and rotate about their center, giving either analogue output with switched reference signals (ZA or ZA2) or end of travel switching only (ZAS).

ZC

The convex top profile of the ZC handle allows for simple thumb control of the JC400 range. 'Person present' switch functions can be incorporated by using the ZC1 external button switch or the ZCS internal switch to verify the change in signals from the joystick, which may help to increase the integrity of your control system.



SW

The cylindrical profile of the SW handle allows full grip use when controlling the JC400 range. 'Person present' switch functions can be incorporated by using a choice of three switch arrays which can offer a combination of finger and thumb activation. The external button switches can be used to verify the change in signals from the joystick, which may help to increase the integrity of your control system, or enable control of additional functions.

ZA HANDLE OPTION

PERFORMANCE

		ZA, ZA2	ZAS
Max height above flange	mm	80	80
Maximum diameter	mm	39	39
Operating temperature	°C	-25 to +50	-25 to +50
Environmental sealing (IEC 60529)		IP65	IP65

Z AXIS MECHANICAL

Handle rotational torque		
breakout	Nm	0.1
operating	Nm	0.15 to 0.25
maximum allowable	Nm	1
Handle mechanical angle	°	±29 to ±30
Handle action		Self centering
Expected life		1 million operations

Z AXIS ELECTRICAL

Analogue track (ZA and ZA2 only)

Resolution		Virtually infinite	Center tap angle	°	±2.5
Track resistance ±20%	kΩ	3.1 or 5.4 (ZA2)	Supply voltage - maximum	Vdc	30
Track operating angle	°	±27	Wiper circuit impedance	MΩ	> 0.1**
Output voltage range	%	7-93 or 25-75 (ZA2) of input	Power dissipation @ 20°C	W	0.25(no load)
Center tap voltage (no load)	%	47 - 53 of applied voltage			

** The long life resistive elements require a high impedance load in the wiper circuit to minimise the current flowing through the wiper for optimum conditions

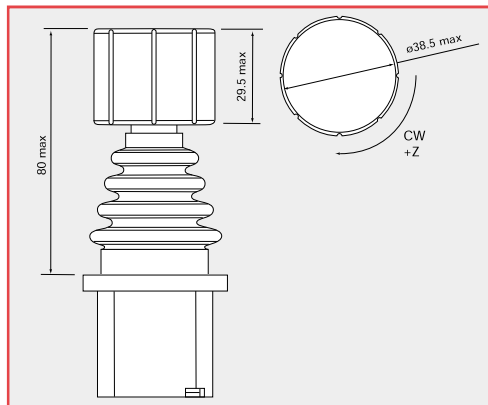
Z AXIS ELECTRICAL

Directional or Centre Switch

		ZA, ZA2	ZAS
Switch operating angle	°	4 either side of center (±1)	20 either side of center (±2)
Supply voltage - maximum	Vdc	30	30
Load current - maximum	mA	2 (resistive)	2 (resistive)

DIMENSIONS

Note: drawings not to scale



Installation note

The protective rubber cap must be removed before fitting the joystick through the mounting hole. Re-fit the rubber cap after mounting in the panel.

ELECTRICAL CONNECTIONS

Leads exit from the underside of the mounting flange. PVC insulated 7/0.2 (24AWG) flying leads, 240mm long

Description

	Flylead colour	ZAS
Z axis positive voltage supply	Yellow/Red	-
Z axis center tap	Blue	-
Z axis negative or zero voltage supply	Violet	-
Z axis output voltage signal	Pink	-
Z switch track N/O (handle CW +Z)	Yellow/Black	Yellow/Black
Z switch track N/O (handle CCW -Z)	White/Red	White/Red
Z switch track common	Red/Blue	Red/Blue

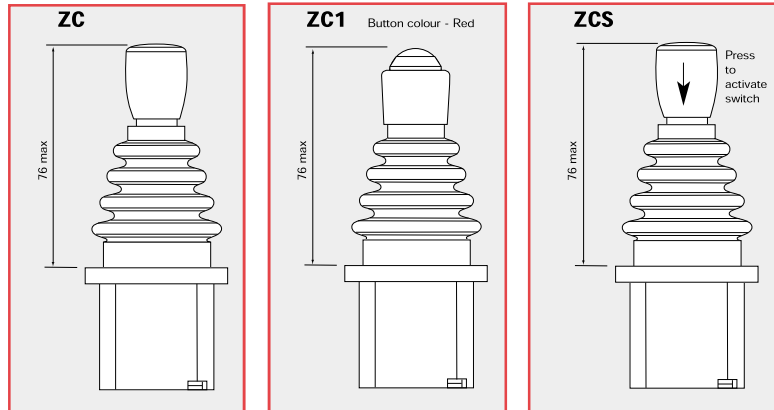
ZC HANDLE OPTION

PERFORMANCE

		ZC	ZC1	ZCS
Max height above flange	mm	76	76	76
Maximum diameter	mm	23	23	23
Environmental sealing (IEC 60529)		IP65	IP65	IP65
Number of switches		0	1	1
Action		-	Momentary button	Momentary handle depress
Switch operating force	N	-	3	7
Maximum current	mA	-	200 @ 50Vdc	100 @ 30Vdc
Expected life	(operations)	-	1 million	500,000

DIMENSIONS

Note: drawings not to scale



ELECTRICAL CONNECTIONS

Leads exit from the underside of the mounting flange. PVC insulated 7/0.2 (24AWG) flying leads, 240mm long

Description

Common terminal
N/O contact switch 1

ZC1/ZCS Flylead colour

Red/Green
White/Black

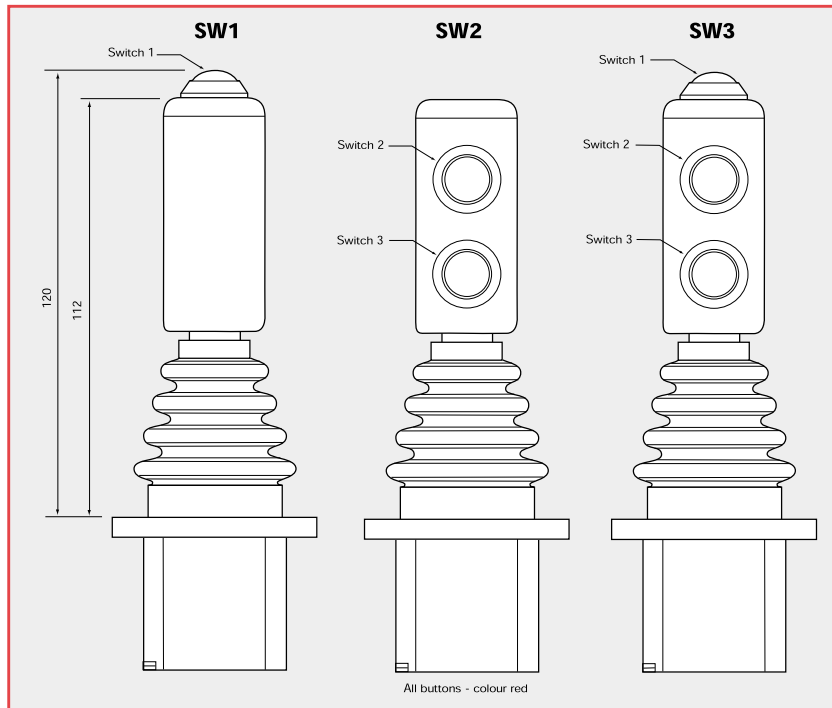
SW HANDLE OPTION

PERFORMANCE

	SW1	SW2	SW3
Max height above flange	mm 120	112	120
Maximum diameter	mm 28	28	28
Environmental sealing (IEC 60529)	IP65	IP65	IP65
Number of switches	1	2	3
Action	Momentary button		
Switch operating force	N 3		
Maximum current @ 50Vdc	mA 200		
Expected life (operations)	1 million		

DIMENSIONS

Note: drawings not to scale



ELECTRICAL CONNECTIONS

Leads exit from the underside of the mounting flange. PVC insulated 7/0.2 (24AWG) flying leads, 240mm long

Description	Flylead colour		
	SW1	SW2	SW3
Common terminal	Black	Black	Black
N/O contact switch 1	White	-	White
N/O contact switch 2	-	Pink	Pink
N/O contact switch 3	-	Yellow	Yellow

This handle option is not available with JC400 Digital Output